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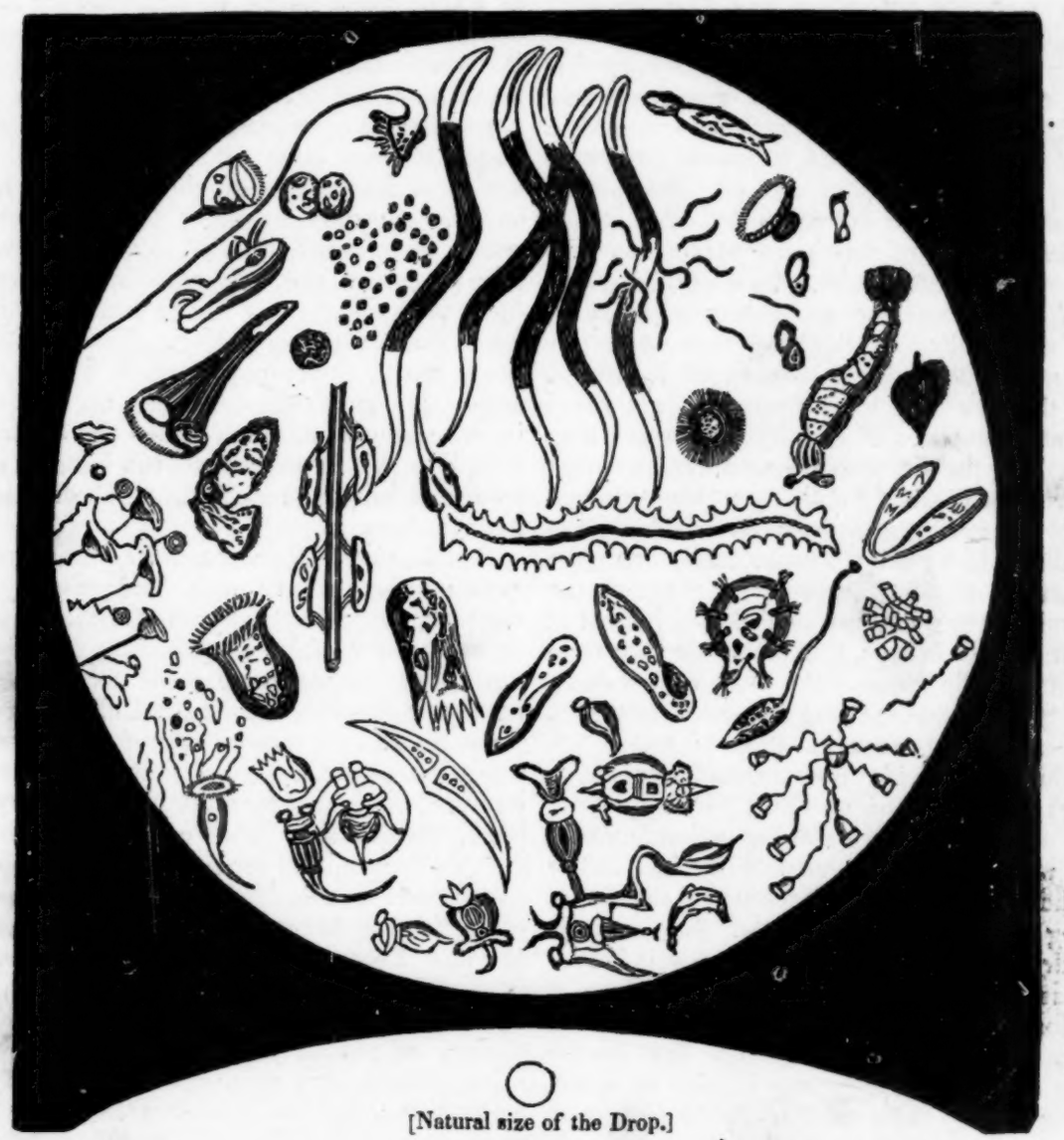
If one train of thinking be more desirable than another, it is that which regards the phenomena of nature with a constant reference to a supreme intelligent author. * * * * * The world from henceforth becomes a temple, and life itself one continued scene of adoration.—BISHOP PALEY.

WONDERS OF SCIENCE.



[Natural size of the Drop.]

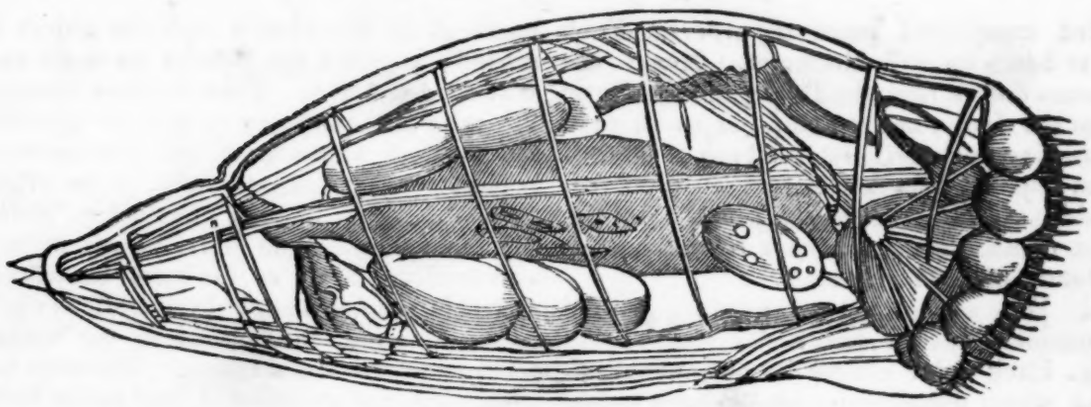
MICROSCOPIC VIEW OF A DROP OF WATER.—It is not certainly known when or by whom the microscope was invented. On the one hand, we are told that one Drebell, a Dutchman, had the first microscope in the year 1621, and that he was reported to have been the inventor of the instrument. On the other hand, the invention is claimed by Francis Fontana, a Neapolitan, in 1646, who dates it from the year 1618. Thus far, however, appears to have been distinctly ascertained, that they were first used in Germany about the year 1621. The telescope is generally believed to have been invented in the year 1590; and, as a microscope is only a telescope inverted, the invention of the one may be readily believed to have originated in the use of the other.

It may, perhaps, be matter of doubt which of these instruments has introduced the most wonderful facts to our notice. If the telescope has brought us acquainted with vast bodies which we had not previously conceived to exist, and thus unmeasurably extended our conceptions of the vastness of the universe, and the power of its Creator, it is no less true that the microscope, though, perhaps, with less imposing pretensions, has laid open to us most unexpected revelations of the wisdom, the power, and the providence of the Almighty, by discovering to us innumerable orders of living beings, endowed with numerous capacities, and provided with ample means of enjoyment.

An example which partially illustrates this last remark is supplied in the engraving prefixed to this article, which represents a single drop of water as it appears through a microscope, peopled with various species of minute animals called *animalcules*, of the habits of some of which we purpose to give a brief account. It may be observed in general of the microscopic orders of animals, that the smallest which have ever come under notice have been discovered in water. Not that we may infer from this that there are not creatures of equally diminutive size inhabiting the air, or creeping upon the earth; the reason is simply that, from the transparency of water, and from its confining the creatures in it, we can more easily bring the assistance of the microscope to bear on the examination of them. Of these, indeed of all animated beings, the *monas* is the most simple. The termo is the most minute creature of this genus, being so extremely delicate and transparent as often to elude the highest magnifying powers, and seeming to blend with the water in which it swims. Another and very minute class of animalcules is that which has been termed by Mr. Baker the hair-like insect, on account of its shape, being extremely slender, and frequently a hundred and fifty times as long as it is broad. These creatures are so small, that millions of millions of them might be contained in the space of a square inch. Yet low in the scale of being as they may appear to stand, owing both to their extreme minuteness and the simplicity of their structure, even these, in common with those orders of inferior animals with which we are more ordinarily conversant, exhibit indications of sagacity, and of the formation of habits. They seem, for example, to be fond of society; for, after viewing for some time a quantity of them taken up at random, the observer will see them disposing themselves in a kind of regular order. If a multitude of them are put into a jar of water, they will form themselves into a regular body, and ascend slowly to the top. When they are weary of this situation, they form themselves into a kind of rope, which slowly descends as low as they intend; but if they happen to be near the side of the jar they will descend upon it. In one experiment, a small quantity of matter containing these animalcules having been put into a jar of water, it so happened that one part went down immediately to the bottom while the other continued floating at the top. When things had remained for some time in this condition, each of these swarms of animalcules began to grow weary of its situation, and appeared disposed to change it. Both armies, therefore, set out at the same time, the one proceeding upwards and the other downwards, so that after some hours' journey they met in the middle. A desire of knowing how they would behave on this occasion engaged the observer to watch them carefully, and to his surprize he saw the army that was marching upwards open to the right and left to make room for those that were descending. Thus, without confusion or intermixture, each held on its way; the army that was going up marching in two columns to the top, and the other descending in one column to the bottom, as if each had been under the direction of intelligent leaders.

Another very singular animal, whose existence and habits have been discovered by the microscope, has been dignified with the name of the *Proteus*, from its assuming so great a variety of shapes as scarcely to be recognized as the same animal in its different transformations. Its general shape bears a considerable resemblance to that of the swan, and its changes are chiefly effected by its neck, which it sometimes extends to a considerable length, and sometimes disposes of it altogether. It also appears to have the power of increasing its transparency or opaqueness at will. There are no eyes, nor any opening in the head like a mouth, to be discerned; but its actions clearly prove that it possesses the faculty of vision, for though multitudes of other animalcules swim about with it in the same water, and its own progressive motion is very swift, yet it never strikes against any of them, but directs its course between them with astonishing dexterity.

Another and a very perfect animal is discovered by the microscope in rain water, which has stood for some days in leaden gutters, or hollows on the tops of houses. This is called the vorticella, or wheel animal. The following is a representation of it, magnified by the microscope one hundred



and forty-four thousand four hundred times. Its most remarkable distinction is the apparatus from which it derives its name, and which, from all descriptions, would appear strongly to resemble the paddles of a steamboat. They change their shape considerably in different views, but it seems pretty evident that they are circular wheels, which perform entire revolutions, and are provided with cogs similar to those on the balance-wheel of a watch. All the actions of this creature, says an observer, indicate sagacity and quickness of sensation. At the least touch or motion in the water, they instantly draw in their wheels; and it is conjectured, that the eyes of this creature are placed somewhere about this apparatus, as, while in the maggot state, its motions are slow and blundering, but after the wheels are protruded, they are performed with great regularity, swiftness, and steadiness. It is by these rotatory organs, also, that they are supposed to breathe.

Some very important discoveries have lately been made by Ehrenberg in his observations on these singular beings. By feeding infusoria with very pure colored substances, as indigo and carmine, he has ascertained the existence of mouths, stomachs, and intestines, and many interesting particulars relating to their structure and functions. But perhaps the most astonishing view of these animals, and of the wonders of the microscopic world in general, is presented by a recent improvement in the solar microscope—we refer to Mr. Gould's instrument, constructed under the direction of Mr. Cooper, and Mr. Carey, the optician,—the extraordinary effect of which is daily exhibited at No. 287 Strand. It acts on the general principle of the solar microscope, but is supplied with an artificial and most brilliant light, produced by the mixture of hydrogen and oxygen gases on lime. The writer had recently an opportunity of witnessing the effect of this extraordinary instrument, and, without describing in detail the beauties of the horrors which it brought to light from the invisible world, (in doing which he would be obliged to draw very largely on the faith of his readers,) he may give some general idea of the spectacle, by stating that the instrument magnifies *three hundred thousand times*, so that a drop of water appears to cover a surface of *a hundred square feet!*

We cannot but anticipate some important accessions to physical science from this extraordinary instrument, and we confidently recommend it to the notice of our readers as a source of much instruction and amusement.—[The Tourist.]

A Compendium of Civil Architecture, arranged in Questions and Answers, with Notes, embracing History, the Classics, and the Early Arts, &c. By Robert Brindley, Architect, Surveyor, and Engineer. [Continued from page 24.]

Q. What is implied by *Order* in Architecture?

A. It strictly defines system, method, regularity. Therefore, the first arrangement of the architect is to form every part of the fabric of proportionate extent, adapted to the magnitude of the whole.

Q. Whence the laws of order?

A. HE who created the universe out of chaos, and pronounced his workmanship *good*, has established it in all its grandeur. View the heavens and their revolving orbs; view nature in her receding forms; and we see the design of the Great Architect. That hand which wrought glory out of darkness and confusion moves all in a system so congenial to his will, and so beauteous to behold, as to implant in the mind of man, that, whilst such mighty objects are maintained in equal balance, and at equal distance, all subluna-ry objects must coincide with the universal regulations.

Q. How was this subject manifested by the ancients?

A. The Grecians and Romans to order

added component parts of orders. Each order bears its own character. Hence the Tuscan differs from the Doric, and the Doric from the Ionic, and so on; nor would each distinctive part assimilate. Thus a Corinthian capital upon a Doric shaft would resemble a grotesque figure indeed: in the same manner would appear a Corinthian entablature on a Tuscan shaft.

Q. Why should not a Corinthian capital surmount a Tuscan shaft?

A. Each order claims its own peculiarities; which peculiarities establish the order, and ascribe the honors to the several inventors. An unison of both would destroy originality and proportion, and render offensive to the eye that which custom, founded on the bases of correct principles, has passed from one age to another.

Q. What is meant by *Disposition* in architecture?

A. In the architectural phrase it signifies a just arrangement and an agreeable unison of all the parts of an edifice. Hence its signification becomes synonymous with order—but to be understood in a wider sense.

Q. What is the first thing to be attended to in the construction or modifying of an edifice?

A. The *Ichnography*, or ground plan: without a priority of consideration on this point, and a perfect acquaintance with the site of ground, no correct plan can be formed; for, whatever conveniences may be considered—whatever arrangements of departments may be made for an edifice by imaginary speculation,—the chance is most improbable, if ever that plan would be appropriated to the localities of the spot selected.

Q. How is this further illustrated?

A. The *Ichnography*, or *Ichnographic projection*, is a representation of the ground plot, described by right lines parallel amongst themselves, and perpendicular to the horizon, from every angle of every object, on a plane parallel to the horizon; the parts where the perpendicular lines or rays cut that plane being joined by right lines. The figure projected on the horizoutal plane is likewise called the *plan*, or seat of that object on the ground plan. The points are the sites, or seats of the angles of the object. The lines are the seats of the sides: by this it is to be understood how the bases of figure, represented as superstructures, stand, or are supported, and by which means the several parts and their areas can be accurately measured.

Q. What is the next consideration of the architect?

A. The *Orthography* or *Elevation* of the building, in accordance with the object intended; in which the Greeks have set such correct examples. Thus, edifices designed for religious purposes should be appropriate in their appearance and arrangement, both externally and internally, to the principles inculcated, bearing chasteness, simplicity, solemnity. The old English style is universally allowed as the most becoming; with this style also accord the edifices erected for learning, exemplified in the several colleges of the Universities. Theatres and other places of amusement, and public buildings, may be built in consistence with the livelier orders of the Ionic, Corinthian, and Composite.

Q. Define Orthography in its architectural acceptation?

A. Orthography represents the vertical position and appearance of the edifice; whence the orthographic projection is called *elevation*. When the *front* of a house is represented it bears this term, and when the side is shown, it is denominated the *profile*, or *flank elevation*. Supposing a house, or any other object, to be divided by a plane passing perpendicularly through it, in a line at right angles with the point, it is called the *lateral section*; but if the plane pass in a direction parallel with the front, it is termed a *longitudinal section*. If the plane pass in either of the former characters, (not, however, deviating from the vertical,) it is said to be an *oblique section*.

Q. What of the situation of buildings?

A. That is entirely circumstantial; choice, advantage, and other causes, govern individuals in their selection. A man of taste will undoubtedly choose a spot, the prospect from which is most agreeably diversified in the distribution of its lands, its woods, and its water; and those who have no relish to the charms of nature, will, perhaps, consult their own comfort more than they may be aware of, by making the same choice.

Q. What is the best disposition of the several departments?

A. Much depends on the relative situation of the house, prospect, &c. Libraries, studies, breakfast-rooms, particularly bedchambers, should face the east. Dining-rooms should face the south, and drawing-rooms the west. Kitchens, pantries, dairies, &c. should always be north, where a cooling and refreshing breeze is constantly wafting. Galleries, paintings, museums, also north, where there is a steady light. If the site of the house be low, the first floor should be set so much higher. Cellars contribute to the dryness of a house, if the ceilings and floors be good.

Q. What is the disposition of ecclesiastical edifices?

A. There appears to be a general rule adopted, namely, the longitudinal part of the edifice to be due east and west, and the altar-piece placed at the eastern end.

Q. To what causes may this determination be attributed?

A. Two or three conclusions may be drawn: First, when our two great progenitors were expelled the garden of Eden, we find that the flaming sword was placed at the *Eastern* entrance. Second, that light is more glorious than darkness; and, passing through the gloomy shades of night, our eyes are directed to the new-coming morn. So impressive is this idea, that we find, even to this period, the Persian prostrate in adoration to the rising orb of day. Third, the star of Bethlehem first appeared and shone in glorious splendor in the eastern hemisphere, declaring to mankind the celestial work begun.

Q. What is one principal object in the regulation of the interiors of churches, chapels, and all places of worship?

A. The situation of the pulpit and desk: the whole assembly should be conspicuous to the minister; and also the minister exposed to the congregation.*

Q. How is this to be effected?

A. The pulpit and desks should not be too elevated; as the souud of voice is destroyed to those seated under the galleries, sound always ascending: and to place them too low is an evil equally as great, unless the galleries slope very considerably—so that the minister may be seen and heard.†

Q. What is the system to be adopted in such arrangements?

A. Lateral and transverse sections should be made of the intended building; and the situation of the pulpit and desks being determined on, lines radiating from a given point, (say from four to five feet above the area of the floor, being the height of the reading desk,) and then intersected by the perpendiculars of the sides and front of the gallery, together with other perpendiculars, will at once regulate every seat: this regulation is applicable to every building, either for churches, chapels, theatres, or amphitheatres, of whatever figures they may be; and unless strictly adhered to, no comfort or convenience can possibly accrue. The Cathedral of St. Paul, London, and the amphitheatre of Oxford, present a noble appearance when the sweeping and graduating galleries are occupied by their several companies.

Q. What is the most prominent feature in Practical Architecture?

A. *Proportion*—defined as the relation a whole building has to its parts, and also the relation which these parts bear to the whole building.

Q. On what are the principles of proportion founded?

A. On the laws of nature, and ideas of the subject become familiar by close and habitual observation of her handy works. In a fabric that is built according to the exact rules of proportion, by seeing any one of its parts, as the diameter of a column, or the height of a perpendicular, we may nearly judge of the size of the whole building.

Q. In what light did the architects of Greece and Rome hold proportion?

A. They were very concise in the proportion of their buildings—which were on immense scales; and the several component parts corresponded in magnificence, utility, and strength. Each order bore a peculiar proportion to itself, and a deviation from it would have destroyed the effect of the whole.

Q. What affinity does strength bear to proportion?

A. Strength is the sinew of proportion—this also is afforded from nature—in which the imitation of man has been peculiarly felicitous in the construction of that solitary pile that warns the watchful mariner of his danger off the Eddystone rocks.

Q. What is the figure of this column, the antitype of strength and proportion?

A. Nature impressed the first idea of the constructor, from the semblance of an oak that had stood the wintry blasts and howling storms in long succession of ages unimpaired. The spreading roots held fast the ground, whilst its bole diminished in gradual concave to the summit—and thus the *Eddystone Lighthouse* rises on the unshaken rock, whilst each swelling surge rolls its fury onwards, and threatens in vain the destruction of the mighty fabric. Every architectural design must be based on proportion.

Q. What are the most appropriate forms for modern built rooms?

A. For general habitations, rectangular, which gives the greatest facility and convenience of arrangement, without losing the space, rendered unavoidable, by adopting circular or curved forms. In height they

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* Originally all the pulpits faced the west, that the eyes of the congregation might see all acts of devotion, and look towards the east, where the sun of Righteousness arose. The first deviations from this rule were introduced by the Persians; and the first chapel erected south and north was the chapel of Emanuel College, Cambridge, founded by Sir Walter Mildmay, a distinguished leader of that sect.

† A moderate voice may be heard distinctly thirty feet in the rear, fifty feet on each side, and one hundred feet in front.

should be at least ten or twelve feet. For spacious apartments, a rectangular parallelogram, or oblong, is a convenient figure, and with regard to beauty, every variation in proportion, from nearly a square to a square and a half, or sesquilateral,* may be employed.

Q. What are the proportionable heights of such rooms?

A. In square rooms, the first story may be in height from four fifths to five sixths of the breadth of the side; and in oblong rooms, the height may be equal to the width. The rooms of the second story may be one twelfth less in height than those below; and for a third story, divide the height of the second into twelve parts, and take nine for the height of such rooms.

Q. What is an eligible portion for galleries?

A. Their lengths should be from five to eight times their widths; their heights may exceed the breadths in proportion of a third, or even three fifths, according to their lengths.

Q. What of the introduction of groins or covings in ceilings, as regards height of rooms?

A. Their depths and heights should be additional to the proportions already laid down—giving greater beauty, and still better effect, to the proportions of the whole.

Q. What is to be observed on *Convenience?*

A. *Convenience* comprehends the subject of disposition in a stronger light, in the plan of domestic economy. It is not to be said, because the disposition of a room, in a certain part of the building, is more congenial to the eye, that it is to be placed in that identical spot, rather than otherwise, where convenience is paramount to the whole. Every apartment, from the drawing-room to the scullery, must be considered as to the use for which it is adopted, and then the *internal arrangements*, which constitute the climax of convenience, can be agreeably disposed of.

Q. How is *Beauty* to be applied to architecture?

A. By comparison, and not inaptly to human nature. Man is said to be beautiful, but Heaven's master-piece is recognized in its after-production. Beauty is comprehended under two heads—that which is *powerful, proportionate, robust*—and that which is *delicate* and *effeminate*. Hence the appellation to the two orders—*Herculean* to the *Doric*, from its lusty shape—and *Female* to the *Ionic* and *Corinthian*—distinguishing the former as a *matron*, from the curling volutes, resembling bands of hair, and the latter as a *virgin*.*

Q. What are the distinguishing features of beauty in architecture?

A. Harmony, symmetry, variety, and native purity. A redundancy of ornament will destroy the most gigantic, or the most delicate, superstructure raised by the art of man; purity and consistency of style being the quintessence of the whole.

Q. What is to be comprehended by *Decorum?*

A. The conducting of the several buildings according to their prescribed orders and authorities. In decorum three things are to be observed, namely, *design, custom,* and *nature.*

Q. What is meant by *Design?*

A. Not merely in making a pretty drawing on paper, and pleasing a fanciful eye, but in the choosing dispositions suitable to the character of the building: thus, other elevations should be executed for a theatre than should be chosen for a place of worship.

Q. What does *Custom* imply?

A. That mode of architecture which the laws of science and mathematics have so well established—yielding, in many instances, to localities and circumstances. In fact, custom implies the doing of those things which are usually done; as the ornamenting the outsides of edifices whose insides are intended to be rich and splendid.

Q. What of *Nature?*

A. The selection of different situations for different rooms, according to the several prospects afforded.

Q. What is to be interpreted by *Economy?*

A. Correct measures, convenient forms, and magnitudes of building. It also signifies a regard to avoid all redundancy of material. Strength is not constituted, on every occasion, by ponderous mass—on the contrary, this produces weakness in itself, and to all

* A figure bearing the proportion as 6 to 9.

* According to Vitruvius, there is an analogy between the proportions of the human figure and those of the orders. "The symmetry and proportion," says this father of the art, "were derived from the human figure—the capital representing the head, the base the feet, and the shaft the body;" and so far is this idea of the reference of the members of architecture to those of the human body carried by Michael Angelo, that he declares a knowledge of anatomy to be indispensable to an architect, who without it must be necessarily ignorant of his profession. Sir C. Wren was intimately acquainted with the proportions, dependences, and relative bearings of the several parts of the animal structure: hence that harmony of design, and proportion of his works, even in imitation of architectural beauties. Indeed, so rigid were the Lacedæmonians in the reciprocity of art and human nature, that the chambers of the females were adorned with the most exquisite models of loveliness and symmetry, that, having their imaginations filled with the ideas of beauty, they might bring forth a beautiful race.

component parts. Therefore, simplicity of construction is the best criterion to be introduced for economy, strength, and durability.

ROOFS.

Q. What is to be comprehended by the term Roof?

A. A roof is the exterior covering of all buildings.

Q. What are the several descriptions of antique roofs?

A. The ancients, in countries where it seldom rained, constructed roofs quite flat; which plan is still continued in countries between the tropics.

Q. Did the Greeks make any alterations?

A. Yes; they inclined their roofs, as appears from several ancient remains, about one eighth or one ninth part of the span; as shown by their pediments: from which, roofs of this inclination are now designated the *pediment pitch.*

Q. What elevation did the Romans make in their roofs?

A. They gave an inclination, in height, to the roofs, from one fifth to two ninths of the span, and also introduced cupola roofs.

Q. After the fall of the Romans, what alterations took place in the roofs?

A. In the northern part of Europe high-pitched roofs began to be adopted; and that was the standard form, which was an equilateral triangle.

Q. What are the advantages of high-pitched roofs?

A. They discharge rain and snow more quickly—are not so easily stripped by the wind—the rain is not blown between the slates—and, from their approach towards perpendicularity of pressure, they are not so great a burden to the walls; but they are more expensive than low roofs—requiring longer and stronger timbers, and a greater surface of covering material.

Q. Of what advantage are roofs?

A. They not only form the covering of the house, but are the principal ties of the building, when skilfully executed in connection with interior walls.*

Q. What is the plan of modern roofing?

A. It partakes of numerous ramifications from original styles; as the dome or cupola roof, the span roof hipped, the pediment roof, the camber roof, the valley roof, &c.

Q. What is the construction of the dome or cupola roof?

A. The dome roof consists of segmental ribs, answering as principals, springing from the ends of the ties or transverse beams, and terminating at a central point, on the summit of the roof, from which they all radiate at equal distances. In many instances the radiating point is intersected by a circular and horizontal plate, a little below that point, against which the heads of the ribs butt—forming an area for the erection of an additional perpendicular elevation. The ribs are supported and strengthened by braces, collar beams, &c. with circular purlins, plates, small rafters, &c. completing the entire form.

Q. What is the span roof?

A. The height is one third of its breadth: it includes *ties*, which are the long transverse pieces, stretching across from wall to wall, of certain thickness and depth—*principals*, varying in number, being two pieces of timber, of like scantling to the ties, meeting each other in the angles, their heels being secured to the ends of the ties, either morticed and tennoned, or chased: *half principals* introduced at the centre of the ends—*hips*, pieces of timber of equal dimensions to the principals, forming the extreme angles of the roof, their heads being secured in the outer pair of principals, and the heels let into *half ties—king post*, a perpendicular piece of timber into which the principals are joggled, and the heel of the post tennoned into the tie—*queen posts*, one on each side of the king post, at equal distances, secured and securing in the same manner—*struts* or *braces*, placed diagonally between the principals and ties, and butting alternately against king and queen posts, to give greater strength to the roof—*purlins*, longitudinal pieces of wood extending the whole length of the roof, on either side, at the extremities of the roof, in two, three, and four rows, to receive the *rafters* at right angles upon them, whose heads are chased to the *ridge piece* in the summit of the roof, running longitudinally, and their heels resting on *pole plates* and *eave boards*. These constitute the entire roof—supported all round on the walls by *wall plates*.*

Q. What is the construction of the pediment roof?

A. It may be executed in the same manner as the span roof, or common gable.†

* Some idea may be formed of the success with which scientific knowledge and experience may be employed in the construction of roofs, when it is asserted that roofs have been constructed sixty feet wide, although they have not contained a single piece of timber more than ten feet long, and four inches square; and be it observed, that the lighter a roof is constructed, the better it is, upon every consideration.

* The common gable roof is of nearly the same description—the king and queen posts being substituted by collar beams and struts to admit of garrets.

† There is, however, a plan lately introduced in the roofs of the Coburg Theatre and some warehouses at

Q. What is the camber roof?

A. It is so called on account of its upper surface *cambering* or rising externally, for the water to run off, and is principally used in churches—sometimes in villas and mansions. It consists of ties, into which the heels of the principals are tennoned, whilst their heads are tennoned into the struts which connect the upper ties of the roof, upon which the camber slips are laid. King posts, queen posts, braces, and rafters, are severally introduced, whilst purlins, rafters, &c. connect the whole together.

Q. What are hip and valley roofs?

A. They are of lighter construction, frequently called M-roofs, and are used for terraces, &c.—generally concealed by pediments, copings, &c. and admitting of no rooms within them.*

Q. What is the curb roof?

A. This is a high roof admitting of chambers, and better adapted for this purpose than the span roof, having a greater area. The principals consist of two lengths, forming an angle; the lower piece, which limits the height of the room, is tennoned into the ties, nearly at right angles; and the upper part of the principal inclines to the apex of the roof. The unison of the parts is effected by a collar beam, with king posts, braces, purlins, &c.

Q. What is the lean-to roof?

A. A very common roof in use, attached to a main building, and consists of principals, ties, purlins, &c.

Q. Of what materials are roofs constructed?

A. Wood, and also iron; of the latter material was the roof to a manufactory at Millbank, and the Royalty Theatre, Commercial road, London, both of which unfortunately gave way, destroying lives and property to a great amount.

Q. With what materials are roofs covered?

A. Slates, pantiles, plaintiles, also boards, with lead, tin, copper, and sometimes canvassed, tarred, and strewed with shingles.

Q. What is centering, cradling, &c.?

A. The construction of frame work for semi, segmental, elliptical, and pointed arches, to bridges, tunnels, vaults, &c.; and this forms a very important feature in carpentry, in connection with roofing. Its purport is to support the stone or brick-work of the arches, until the whole is arranged, and requires to be of extraordinary strength, as it has to support the weight of every stone or brick singly, until the key-stone is introduced; when, by this junction, the arch is secured of itself, in the whole weight being brought vertically, and the cradle is ultimately removed, to supply the formation of any other arch.

Q. How is such centering constructed?

A. By ribs, forming the curvature of the arch, placed about two feet apart from each other in their sweeps. The heels are tennoned into, or bolted to, the plates resting on the piers; whilst with ties, braces, chocks, &c. the whole is firmly united by iron bolts, screws, plates, &c.*

NOTE.—The description of the arched, pendant, groined roof, &c. has already been given and exemplified under the head of English Architecture.

New Analysis of Corrosive Sublimate and Calomel. By Dr. TURNER. [From the Repertory of Arts.]

BICHLORIDE OF MERCURY.—The corrosive sublimate of commerce was purified by repeated crystallization from distilled water, and was then well dried at its subliming temperature. It might in that state be sublimed without giving any trace of humidity. Of this chloride 137·595 grains were dissolved in warm water, and directly decomposed by nitrate of silver; and the chloride of silver was washed with water acidulated with nitric acid, and amounted in the fused state to 144·374 grains, equivalent to 35·659 of chlorine. The bichloride of mercury would hence seem to be composed of

Mercury - -	101·936	201
Chlorine - -	35·659	70·31

giving 35·16 as the equivalent of chlorine. This result led me to suspect some imperfection in the method of analysis; and I accordingly found that some of the bichloride of mercury is apt to combine with the chloride of silver, and being expelled when the latter is fused, a loss of chlorine is occasioned. To avoid this error, the bichloride was decomposed by lime, which was prepared from Carrara marble, and was quite free from muriatic acid. The requisite quantity of lime, previously slacked, was mixed with a little warm water, and the solution of

Dock Head, quite novel, and remarkable for its simplicity and strength. Instead of the ties running transversely, two ties or braces are placed at angles with the principals, intersecting each other in the centre, and scored; the foot of the tie is chocked and bolted to the foot of the principal, whilst the head is tennoned into the opposite principal, one third distance from the top, the opposite tie and principal corresponding. The whole is secured by three vertical bolts, plates, and screws, one in the centre, and one on each side.

* It is to be observed, that where roofs are in part or wholly concealed by pediments, copings, &c. gutters are thereby formed between the angles; which have, in carpentering, gutter-boards, bearers, &c.

* The late centering to the arches of the new London Bridge was a fine specimen of the art.

a known weight of corrosive sublimate gradually added, shaking the mixture after each addition. After a short digestion and filtration, the liquid was neutralized by nitric acid, and the chlorine determined by nitrate of silver in the usual manner. Every trace of muriatic acid may thus, without the necessity of boiling the materials together, be transferred to the lime and rendered soluble, while the oxide of mercury, of an orange color, is left with the excess of lime. In this way I obtained the three following ratios :

	Mercury.		Chlorine.	
1st.....	113·441	201	39·748	70·428
2d.....	113·149	201	39·723	70·564
3d.....	112·535	201	39·433	70.43

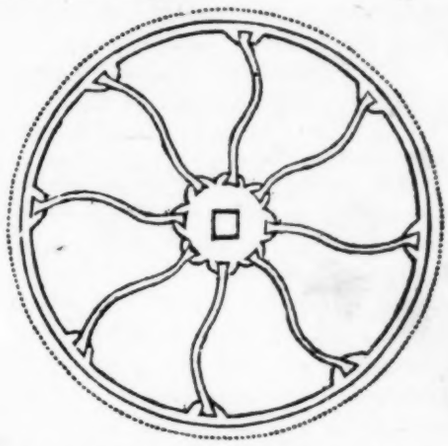
According to these results we obtain 35·214, 35·28, 35·26, as the equivalent of chlorine.

Calomel.—The proto-chloride, though much more stable than the protoxide of mercury, is very subject to change. I believe it is impossible to sublime calomel without a portion being resolved into mercury and corrosive sublimate; and after washing calomel, so as to remove the adhering bichloride, the heat subsequently required for rendering it quite dry causes a fresh production of corrosive sublimate. I selected for analysis the pulverulent white calomel prepared by Mr. Howard, and dried it by exposure to a continued heat of 300° Fahr., at which temperature it undergoes no appreciable decomposition, and contains only a trace of moisture. But that trace of humidity affects the ensuing results with a small error, the tendency of which is to make the equivalent of chlorine smaller than it is. The following are the ratios of three careful analyses, which were made by means of lime, as in the analysis of corrosive sublimate :

	Mercury.		Chlorine.	
1st.....	100 048	201	17·602	35·361
2d.....	95·154	201	16·721	35·32
3d.....	76·565	201	13·473	35·37

Experiments on Wheels with Straight and with Curved Arms. [From the London Mechanics' Magazine.]

Sir,—Having read some remarks, by two or three of your correspondents, in regard to springs as applied to locomotive engines and other heavy carriages, and noticed the suggestion thrown out, that the spokes or arms of the wheels might possibly be made of such materials, and of such a form, as of themselves to counteract sufficiently the jolting of the superincumbent and progressing weight, and so dispense with the costly springs at present used, I am induced, by the perusal of these speculations, to send you an account of some experimental observations of my own, which have, I think, a strong bearing upon the subject. About five years ago, I fitted up some waggons, for a coal concern, which I have the management of here, to run upon a railway of cast iron. The wheels are of cast iron, but have *wrought* iron arms, in the form and manner following :



In giving this curved form to the arms, I did not at the time contemplate that they should act as springs; though, as will be presently seen, it has been attended with great advantage. The ordinary weight of these waggons, when full of coal, is about 3 tons 15 cwt., waggon included. On this same railroad, an iron company have the privilege of conveying their iron ore, the waggons employed for which purpose are entirely of cast iron, with straight arms, and, when loaded, weigh (waggon included) something less than 3 tons. In the course of last summer, I found it necessary to repair a wooden bridge of considerable extent, over which both kinds of waggons had to pass, during the time these repairs were going on. To the great surprise of the workmen, they found that our own waggons, although the heavier, as above stated, produced less effect on the bridge than the others. This I could only attribute to the difference in the form of the arms of the wheels; and every observation which I have since made serves to confirm me in this conclusion. I have rode alternately on both sorts of waggons, when at their greatest speed, and certainly a sensible difference is felt to the advantage of the crooked and slender arms. The noise also which they make is much less. It may be proper to add, that the wheels with the wrought iron arms stand their work uncommonly well—much more so than the others. The fact is, we have not had one broken or worn out during the five years that they have been in constant use.

Should this article have the effect of turn-

ing the attention of some of your ingenious readers to the subject, it might be of service. Our wrought iron arms are 5 inches wide, and scarcely ⅜ of an inch thick. Supposing, then, that, instead of being of wrought iron, they were made of steel of suitable quality, they might be made thinner than ⅜, and with a greater number of arms: a much better form of curve, too, than that I have employed may very possibly be suggested.

I am, sir, yours, respectfully,

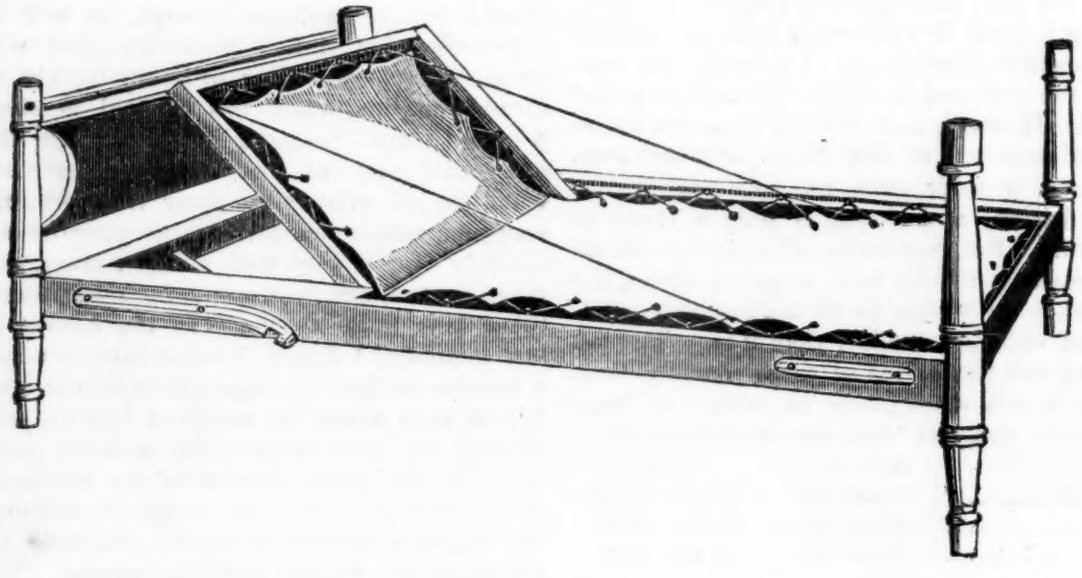
Wm. Brough, Mineral Surveyor.

Cwmneath, Glamorganshire, Dec. 15, 1833.

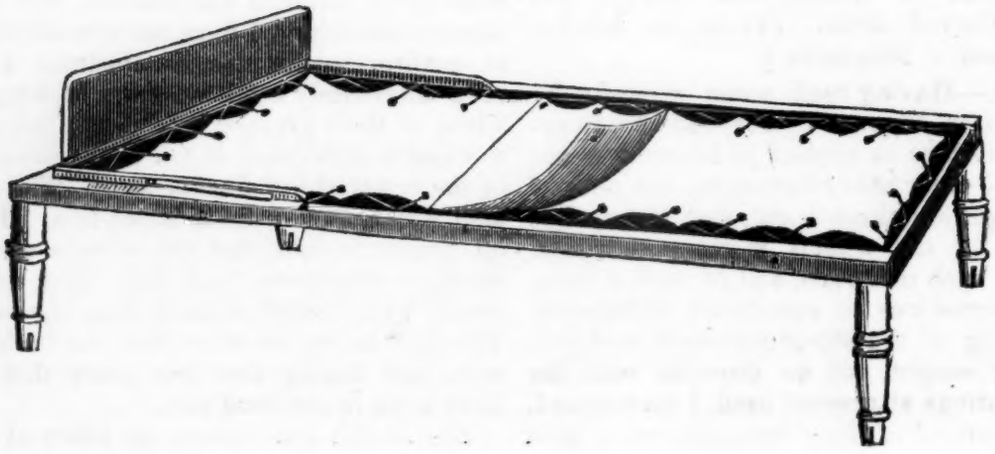
New Invention.—A gentleman in Boston, who owns a large chemical establishment, has discovered a new species of fire, which produces a most intense heat. It is produced by the mixture of tar and water. With this kind of fuel a steamboat can cross the Atlantic, with the greatest safety. The discoverer declares that he can carry a steamboat from Providence to New-York, by using this fuel, for five dollars. It is said that the invention of the cotton gin doubled the value of every acre of land in the southern States, and we are of opinion that the discovery above mentioned will double the value of the steam engine. It will be especially important to the engines which are employed upon railroads, and will remove one of the greatest obstacles to the general use of locomotives upon our common roads. —[Taunton Reporter.]

Woolley's Patent Improved Bedstead for Invalids.—Mr. Woolley has been some time constructing a bed for invalids, which will also answer as one for ordinary use. Fig. No. 1 represents the ordinary bedstead improved, either as a French bedstead or field-post one, raised to suit any elevation in the centre, to make it a chair, supported by cords, or rods of cast iron.

No. 1.



No. 2.



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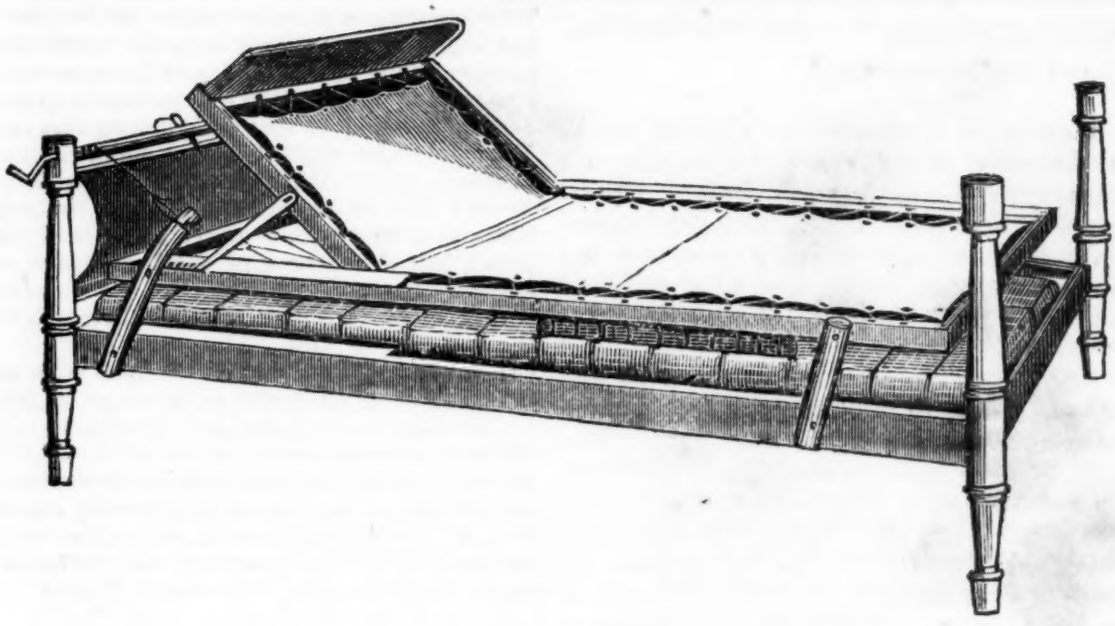
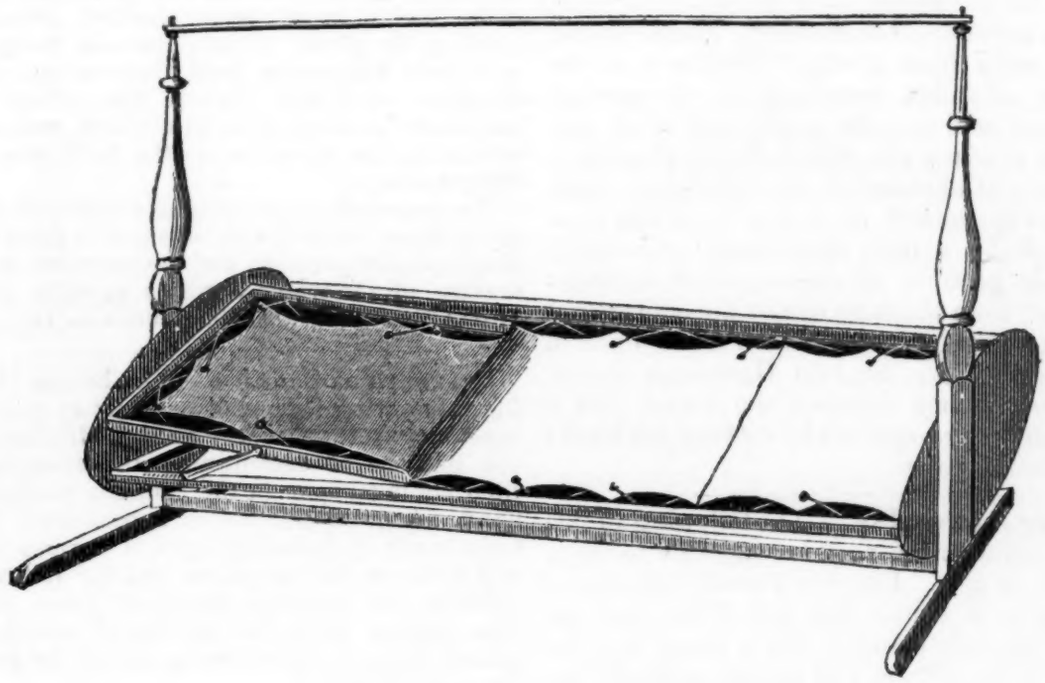


No. 4.



No. 2 is an ordinary cot bedstead, which, divested of its legs, is made advantageous to the invalid when placed on the top of No. 3. The sacking of No. 2 is used as a sheet when there placed, and can be tightened quickly or not, as may be necessary, which, in cases of fractures, is sometimes of great importance; under No. 2, when moved to the top of No. 3, is a mattress, and the whole is moved by levers, to two of which a cord is attached, and by means of a small crank can be raised or lowered, as best suits the patient's inclination, by a child of 10 or 12 years.

No. 4 consists of No. 2 placed on a frame similar to the swing cradle, by which those who are afflicted with ulcers, &c. can be frequently turned with ease, and without incurring additional pain.

The price does not much exceed the ordinary price of bedsteads. Mr. Woolley has shown us several certificates from some of the most eminent medical men in this country, stating that in their opinion his invention

is calculated greatly to mitigate the sufferings of all who may be confined to their beds by sickness or otherwise.

Damascus Steel.—The steel of which the beautiful sword blades of Damascus are manufactured has hitherto baffled all attempts at imitation. It is generally supposed to be made of slips or thin rods of iron and steel, bound together by iron wire, and then melted together by heat. The most skilful workmen of other countries have attempted to imitate this process, but in vain : so that there is reason to think that the secret of the manufacture has not yet transpired. The color of the Damascus blades is a dull bluish gray, and scarcely exceeds in hardness common steel from the forge. It is difficult to bend, and when bent does not resume its shape ; the principal character, however, is its *water*, or a peculiar wavy appearance running from the hilt to the point in narrow lines, the thickness of a harpsichord wire, which never cross each other. These waving lines arise from a slight difference in the degree of polish occasioned by the unequal action of acid upon the steel; any weak acid would produce this effect, but at Damascus sulphate of alumine is the substance used. This appearance of waving lines has been imitated by a false damasking, or etching, but the genuine Damascus blade is distinguished from the false one by the obliteration of the lines in grinding, which takes place in the latter. In the real Damascus blades, grinding nearly removes the water, but it immediately re-appears by rubbing the blades with lemon juice.

Sympathetic Ink.—The following affords a sympathetic ink very far superior to any, as yet, in use. Dissolve a small quantity of starch in a saucer with soft water, and use the liquid like common ink : when dry, no trace of the writing will appear upon the paper, and the letters can be developed only by a weak solution of iodine in alcohol, when they will appear of a purple color, which will not be effaced until after long exposure to the atmosphere. So permanent are the traces left by the starch, that they cannot, when dry, be affected by Indian rubber; and in another case, a letter, which had been carried in the pocket for a fortnight, had the secret characters displayed at once, by being very slightly moistened with the above-mentioned preparation.

Heat.—It has been said by an astronomer, that a globe of red hot iron as large as our earth would scarcely cool in 50,000 years. If this be true, then the comet which appeared in 1680, cooling a hundred times as fast as the hot iron, its heat being actually 2,060 times greater, would take a million of years to become perfectly cool, admitting it to possess a quantity of matter equal to that constituting this earth. That the comet alluded to was solid, cannot be doubted, as Sir Isaac Newton clearly demonstrated that in its passage through the neighborhood of the sun, it must have been dissipated, had it not been of solid compact substance. In its perihelion, Dec. 8, it was observed to be to the distance of the earth from the sun as 6 to 100. The sun's heat in the comet, at that time, was to the heat with us at midsummer as 1,000,000 to 36, or as 28,600 to 1. Had the comet consisted of exhalations of the sun, as some astronomers of the day intimated, it must have been completely dissipated; for the heat of the sun, it is generally allowed, is as the density of his rays, or in other words, reciprocally as the squares of the distances of places from the sun.—[Scientific Tracts.]

Atmospheric Pressure.—The hamlet of Antisana, which is 13,500 feet above the level of the ocean, is the most elevated inhabited place on the globe. Condamine and Bouguer, with their attendants, lived three weeks at an elevation of 14,604 French feet, where the barometer stood at 15 inches 9 lines, and, consequently, the pressure on the body was 16,920 pounds.

The pressure on the body of a common sized man, whose surface is about equal to 12 square feet, is 25,056 pounds; and the pressure on the surface of the whole earth is equal to about 11,642,019,840,000,000,000 pounds.—[Ibid.]

Strength of Cordage.—The Boston Hemp Manufacturing Company have lately put up a machine, at their ropery on the Milldam, for the purpose of determining the strength of their cordage, spun in the common method by hand. A great number of experiments have been made by breaking ropes of various sizes and kinds on this machine, and the following exhibits the average result of these trials. The figures show the number of pounds required, *by each inch of the square of the girt of the rope, to part it.*

Whale line spun by hand, best that could be produced,	776 lbs.
Whale line spun by machines,	994
Russia bolt rope, 1st quality,	723
Bolt rope of machine spun yarn,	915
Running rigging, 1st quality Russia,	442
Running rigging, American, spun by hand,	631
Running rigging of machine spun yarn,	717
Cotton line,	604
Coire rope,	215
Rope made of Manilla hemp,	610
Rope made of New Zealand flax, *Phormium Tenax*,	722
Mean of all hand spun hemp rope,	633
Mean of all machine spun hemp rope,	875

Showing the machine spun rope to be 36 per cent. stronger than the hand spun. If, however, we reject the trials on Russia cordage, which is very weak, the superiority of the machine spun ropes is reduced to 24 per cent. over all others.

In no instance whatever, was the trial on machine spun ropes made on selected specimens, but the pieces to be tested were taken from common coils as made for use. Indeed, it happened that the machine spun ropes, except the whale lines, were made of hemp inferior in quality to that usually wrought in the machines. The modulus of cohesion, of the strongest ropes in these experiments, is 30,700; or a rope of this strength could be let down into a pit 30,700 feet, or 5-8ths of a mile, before it would be broken by its own weight. A rod of iron can sustain itself, according to Mr. G. Rennie, only for a length of 19,700 feet.

On the 27th of March, by the politeness of Mr. Treadwell, we witnessed the operations of the machinery for preparing the hemp and spinning the yarn; and we were also shown the method of impregnating the ropes with tar, which is done uniformly throughout their whole thickness, the tar being kept at a temperature below the boiling point. The ropes made of these yarns have the appearance of being *stained* rather than *tarred.*

The superior strength of the ropes made from yarn spun by machinery appears to consist in this, that the fibres in the middle of the yarn are nearly of the same tension as those of the outside, whereas, in the yarn spun by hand, they are much more tense in the middle; and the short fibres being the first to give way, the whole stress is thrown upon the outside ones, which, being fewer in number, consequently cannot bear so much strain as a rope made up of fibres of equal tension.

The machine for trying the strength of ropes is so constructed as to try them fairly and accurately. The following experiments on the strength of three ropes were tried in our presence, and we have no doubt of their correctness.

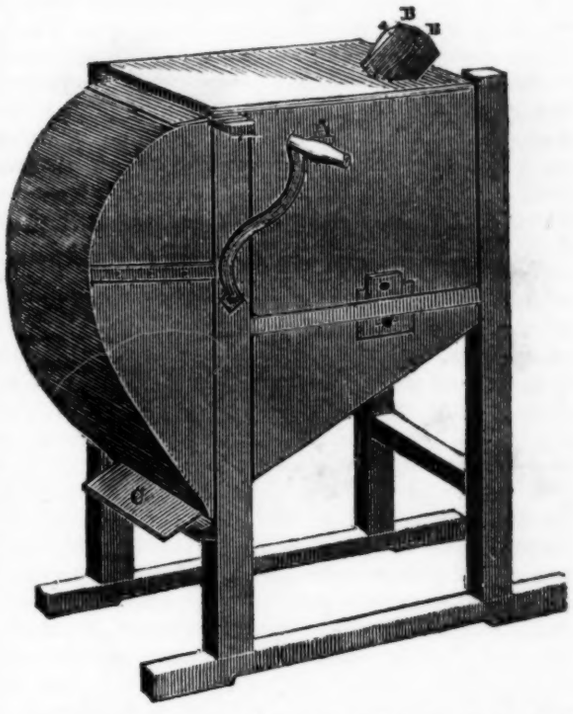
No. 1. Whale line spun by hand—girt 2 inches; broke by 2240 pounds.

No. 2. Whale line made by Boston Hemp Company, spun by machinery—girt 1 $\frac{7}{8}$th inches; broke by 3520 pounds.

No. 3. Running rigging made by the Boston Hemp Company—girt 2 $\frac{1}{8}$th inches; broke by 3440 pounds.

As No. 2 was one seventh smaller than No. 1, we should add 502 pounds to the weight it actually bore, making 4022 pounds, for the weight it would have borne, if it had been of the same size as No. 1: consequently it was 64 per cent. stronger than No. 1. Again, No. 3 was one ninth larger than No. 1; we must therefore deduct from the weight it actually bore 382 pounds, leaving 3058 as the weight it would have borne, had it been as small as No. 1. It was therefore 25 per cent. stronger than No. 1.—[The Mechanic.]

Corn-Shellers, Corn-Crackers, and Turnip-Cutters. [Communicated for the New-York Farmer and American Gardener's Magazine.]



Among the machinery which mechanical ingenuity has furnished the farmer, to expedite farming operations, is the Corn-Sheller. They are constructed to shell either one or two ears at a time. They require two persons, and will shell perfectly clean, and nearly as fast as one can put in the ears; consequently the number of bushels in a day must be very considerable. Some of them, as in the present drawing, have the shelling apparatus incased, to prevent the corn from being scattered. B B are the two openings into which the ears are dropped; A, the turning crank; C, the opening at which the corn comes out. The prices for substantially built machines vary from 8 to 15 dollars.

H. Huxley & Co., 81 Barclay street, have affixed to the Corn-Shellers a simple apparatus for cutting turnips and potatoes for stock. They are also appending one for cracking the corn.

Steam applied to Agricultural Purposes.—We have heretofore expressed our opinions on this subject. We now state, that if the scientific ingenuity and the capital of this country could be combined, and steam immediately applied to agriculture—and that, if prejudices should retard its application in Europe,—we should, in comparatively few years, cause every principal nation in the world to crush by the weight of their own institutions. But Eu-

rope will, and *must*, have the plough driven by steam. From an article in the Quarterly Journal of Agriculture, we make the subjoined extracts.

From the Parliamentary returns, the horses running in coaches in Great Britain, in 1828, amounted to 178,841; and we are perhaps much within the mark when we suppose that these, with all the horses employed in drays or draught, exclusively amount to 600,000. It is said by some, that each horse consumes what will support eight individuals. The suppression, therefore, of these horses alone, (which does not include one horse employed in agriculture or for pleasure,) will save what will feed 4,800,000 people. The annual consumption of grain, by human mouths, in Great Britain, (viz. 16,000,000,) is about 32,000,000 quarters, of which not one-twentieth part has, during any year, been imported. But the saving of what would feed, by the removal of the horses used for transit alone, 4,800,000 people, amounts to more than what is consumed by the fourth part of the said population. If importation of grain, then, to the very limited extent of one-twentienth, viz., 1,600,000 quarters, has hitherto been deemed an evil of no little magnitude by the agricultural interest, what will they consider a system which will abridge home consumption equal to one-fourth, viz. 9,600,000 quarters? At first sight this will appear to the agriculturist as involving more certain and complete ruin than even that which would follow the repeal of the corn laws. But this is taking a narrow, a prejudiced view of the matter.

The application of steam to purposes of husbandry will so cheapen the cost of production, as to reduce the price of food with remuneration to the growers. It is well known, that the expense of horses forms the principal item in the outgoings of the farmer. The late Dr. Colquhoun, so far back as the year 1812, in the estimate which he makes of the new property created annually in Great Britain and Ireland, taking each kind of grain at 50 per cent. less than the average prices in the public markets of the 12th September, states the crop of hay, grass, straw, and vetches, as amounting in value to £89,200,000.

And the portion of this consumed by horses was as follows:

Horses in Great Britain and Ireland, estimated at 1,800,000, at 45s. each for grass,	£4,050,000 0 0
For hay, at £6 each, - -	10,800,000 0 0
For straw, at 5s. each, - -	450,000 0 0
For beans and peas, - -	2,640,666 13 4
No separate item is given for corn, but taking the half of that consumed by animals generally, as consumed by horses, viz., £14,790,000,	7,395,000 0 0
We have - - - -	£25,335,666 13 4

—which is substracted from the above, purely to support the brute labor which it is now possible to supplant, in a great measure, by steam. When it is farther considered how much horses have multiplied since the period mentioned, it is perhaps speaking greatly within bounds, when we suppose they are maintained at a yearly expenditure of £30,000,000. It is not difficult then to perceive, how the suppression of horses, either in whole or in part, will economise a saving in farm management sufficient to effect a great cheapening of agricultural produce with advantage to the producer, and benefit to the consumer.

Though difficulties exist in the minds of agriculturists, who have not turned their attention to the subject, as to the possibility of extending steam to husbandry purposes, no difficulties exist in the opinions of many eminent machinists who have turned their attention to it. We have had conversations with several patentees, who have each assured us that there are no practical difficulties in the case, provided there was any inducement for them to direct their skill to such a species of machinery. Mr. Phillips' getomic apparatus, the model of which we have seen, though far from being a perfect machine, is yet sufficient to show that a little farther simplification is all that is required to render it such. We are happy to say, that, in our notions respecting steam-ploughing, whether as regards its practicability or importance, we are corroborated by a Fifeshire farmer, who, in a letter of the date 24th December, 1833, published in the Fife Herald, remarks, "that at present, when the ingenuity of man is upon the stretch to devise means to abridge human labor, and add to the comforts and intelligence of a redundant and still increasing population—when, by our absurd laws, the manufacturer is under the necessity of giving an extravagant price for the first necessaries of life—when industry is fettered, and the growing resources of the country are circumscribed, our tenantry wasting their time and means, and crouching under the power of their proprietors, on account of a corn monopoly,—I wonder it never struck some of our agriculturists that they might, like the manufacturers, endeavor to undersell their neighbors, and drive them out of the market. I know it will be said, that it is impossible—but what I am going to suggest is a farther extension of machinery, to assist us in keeping ourselves ahead of our neighbors, and that is the application of steam to the working of ploughs. At present, it requires nearly the half of the produce of a farm to pay the necessary expenses, and a great part of that goes to the keeping of horses, harness, &c. Now, if the farmer could get a steam-engine to work his ploughs, harrows, and rollers—thrash and shear his corn—cast his drains, and rid his land of large stones,—he would be able to pay his present rent, although there were no corn-laws, and grain one-third cheaper than it is."

We have gone into this detail, not because we advocate the application of steam to general locomotive purposes, merely from the love of change, without any other reason than that change is the order of the day: no, but because there are numerous weighty, and what ought to be *imperative* reasons, for the agricul-

tural classes giving this matter their deep and serious attention. From the whole course of events, no man can be so blind as not to perceive that, upon the subject of the corn laws, the agricultural and manufacturing classes are about to come shortly into a fearful collision. Cheap bread is a thing that our starving and oppressed people must have, either by a cheaper system of cultivation at home, or by importation of corn from abroad. The alternative is the choice between the life and the death of the State. For surely it is madness amounting in degree to theirs whom the ancients conceived were doomed to perish, to suppose that cheap bread, by a method that will ruin our domestic agriculture, will not precipitate the country into that state of social disunion which the whole tendency of our affairs shows to be in course of progression. Now, let it be supposed that steam has had nothing to do in maturing this condition. During the last quarter of a century, it has been applied to what may be called *physical* purposes only, *i. e.*, to purposes which have materially abridged manual labor, and multiplied almost indefinitely every species of commodity, whilst it has not been applied to any one purpose that has increased human labor, or saved the consumption, and cheapened the production of food. Consequently there has been a gradual disapproximation between the necessaries and the conveniences of life, until, after nineteen years of peace, and what ought to have proved financial recruitment, it has reached an extent which has unbalanced consumption and production to a degree which is paralysing all commercial and agricultural transactions, fearfully increasing pauperism and crime, fomenting sedition, and threatening the peace, order, and best interests, social and civil, of society.

The extension of steam to *economic* purposes, *i. e.*, to purposes which will permit the removal of brute labor, will remedy the evils arising from its partial application; for, as we have shown, it will save and cheapen food, and that by a way which, over and above its improvement of internal communication, will improve the coal trade and iron trade, those pillars upon which the prosperity of the country is said to rest, as well as every department of manual industry. Applied exclusively to physical purposes, machinery as yet has, with all its advantages, been attended by evils far from being partial. Extended further to economic purposes, the good that will follow will not be short of universal. Hitherto its abuse, that is to say its former application, alone has been pernicious; now its use, that is to say, its latter application, will be commensurately beneficial. Machinery has made goods,—machinery also must make a market. The existing circumstancees of society demand this, otherwise all will terminate in convulsion.

There is not a laborer in the three kingdoms who does not feed his belly at the expense of his back. This is an evil of no trifling character, for it is one which affects the entire industry of the country; and farther, it is one which, for the interest of all parties, ought to be removed without loss of time.

In order more effectually to promote this object, and carry the project extensively into operation, a NATIONAL INSTITUTION OF LOCOMOTION, unconnected with any trading company, is now in progress of being formed to promote the application of steam to general purposes of transport and husbandry, and to supply the desideratum which has long been experienced of there being no metropolitan association, in connection with the various companies and local societies throughout the united kingdom, formed for the advancement of commerce and agriculture.

When we consider how exigent is the WANT which steam applied to economic uses is commissioned to alleviate, and how reckless in its consequences, as that volcano indicates whose eruptions are now nightly visible in the farmyards of some district or other of the country, we consider it fortunate that, if CHEAP BREAD be wholly unavoidable, it can now be procured in a way that makes it wholly desirable. The bane of having prices reduced by steam transport, and the antidote of providing for the same by steam husbandry, are both before our agriculturists. We cannot suppose that they will allow the one to be introduced unaccompanied by the other. In the hope that this will be the case, we cannot conclude this paper without congratulating all orders of our fellow-subjects upon the bright prospects which the general application of steam to brute labor purposes opens upon us. At a moment when the resources of the country are no longer adequate to the wants of our population, "WHEN A RESTLESS SPIRIT OF DISCONTENT IS EVERYWHERE ABROAD," and cheap food of *home growth* is a *sine qua non* to an ameliorated condition, this beneficent agent steps in to accomplish what could not have been effected by any *external* process whatever. The speedy and general introduction of steam cultivation is all that is required to make cheap bread in Britain, in a way that will reduce no one to destitution in Britain. If our industrious classes must still earn and eat their bread by the sweat of their brow, they shall nevertheless eat it in plenty, and in contentment. Under the social economy which the extension of steam to the purposes of animal labor will allow, it shall no longer be said that the wealthiest empire in the world is also the most wretched one, or that, with all our boasted wisdom in science and art, we are unwise in that which not rightly to know is misery and unhappiness! The better policy of the age of steam must be to make millions rich instead of the units,—to render monopoly the property of the state and not of the stock-jobber,—to comfort a thousand happy homes, instead of building up one bloated capitalist. Steam, which, confined to physical purposes, hitherto has wrought such marvels, extended further to economic uses, can achieve all this, for by *home means*, equalizing the price of necessaries and conveniences, it WILL ADJUST PRODUCTION AND CONSUMPTION; the unbalanced condition of which alone has deranged the currency,—paralyzed transaction,

—abridged industry ; and, in a word, occasioned all those evils which at length have produced a nation divided into usurers and paupers, to the danger alike of the constitution, the altar, and the throne. R. B.

Patent for an Improvement on the Mode of fixing Valves on the Boilers of Steam Engines. Granted to DAVID B. LEE, city of Philadelphia, January 23.

The safely valve here patented is, we are informed, "a fixture for boilers for steam engines, to prevent *collapsation*, resembling the common safety valve, except that it opens in by the pressure of the atmosphere." And "the part claimed as an invention, or discovery, is not the particular form of the valve, but the general plan of fixing a valve, or valves, to boilers of steam engines, which shall open with an external pressure, to prevent collapsation."

A very little reading would have shown to the patentee the antiquity of his invention, as an account of it may be found in most, if not in all, of the numerous histories of the steam engine. We could take from our shelves a dozen books from which to quote upon this point, and could refer to numerous patents in which such valves are noticed. In the article *Steam Engine*, in Rees' Encyclopædia, after speaking of the safety valve in Watt's engine, it is observed, that "there is another valve of safety for the reverse of the object of the first mentioned safety valve ; it opens internally, and is balanced by a small lever, and a sufficient weight to keep it shut, until the pressure of steam within the boiler becomes much less than the external air, which then forces open the valve, and enters into the boiler till the equilibrium is restored. It is evident that this valve can never be necessary so long as the engine is at work ; but its use is to prevent the sides of the boiler being crushed in by the weight of the air, when it has done work, and the steam within it cools and condenses."

This kind of valve has, in fact, been applied to hundreds of boilers, stills, &c. With the kind of boilers which we now ordinarily use in steam engines, valves of this kind are not employed, for the simple reason that they would be of no use. Our cylindrical iron boilers do not collapse by the pressure of the atmosphere, which they would be able to sustain, even if perfectly exhausted ; nor is the collapsing which frequently takes place, a collapse of the boiler, as the patentee appears to suppose, but of that of the flue which passes through it, and which is forced in, not by the pressure of the atmosphere, but by that of high steam, occasioned in general by the water being allowed to descend too low, which admits of the heating of the upper part of the flue, and the consequent diminution of its strength; it then yields readily to a pressure, which, under ordinary circumstances, it would have sustained most effectually.—[Journal of the Franklin Institute.]

The following is a specimen only of letters we are continually receiving; it was intended to be inserted before.

To the Editor of the Railroad Journal.

SIR,—Please accept my thanks for the number of the "Mechanics' Magazine and Register of Inventions and Improvements," which you were so good as to hand me. I have long desired to see the work, and have now examined it with some attention. I consider it a most valuable auxiliary in the cause of improvement, and a great aid to the progress of the arts amongst us. The great variety, as well as the extent and importance of the information it presents, render it a most desirable work for any mechanic.

The time has at length, I hope, arrived, when *practical men*, whether mechanics or artisans, farmers or gardeners, will lay aside the absurd prejudices so long entertained against books and *book learning*. A constant *routine practice*, justified on the old plea, "This is the way we *always do it*," can never lead to, or admit of, judicious melioration in any thing. Scientific investigation, applied to existing modes of practice, and proved by careful and well conducted experiment, is necessary to the attainment of real improvement, and even to an advantageous use of the informatien actually possessed. A spirit of inquiry is necessary to every mechanic of the present day, who wishes to excel in his peculiar branch, and such aspirit your Magazine is, in my opinion, eminently calculated to foster and direct. No mechanic should be without it; every mechanic may possess it at its present price.

With best wishes for your success, I remain, your obliged and obedient servant,

H. F D.

New-York, June 5, 1834.

THE *Mechanics' Magazine and Register of Inventions and Improvements* is published by the Proprietors, D. K. MINOR and J. E. CHALLIS, at No. 35 Wall street, New-York : in *weekly* sheets of 16 pages, at 6¼ cents—in monthly parts of 64 pages, at 25 cents—in volumes of 384 pages, in cloth boards, at $1.75—or at $3 per annum, *in advance*.—JOHN KNIGHT, (formerly proprietor of the London Mechanics' Magazine,) Editor.